SECTION 8

RECOMMENDED CLEANUP ACTIONS

8.1 INTRODUCTION

8.1.1 Cleanup action alternatives have been evaluated for each of the site types located within Camp Bonneville. In general, Target Areas, Firing Points and OB/OD Areas were determined to pose the greatest explosive safety exposure hazard. Based on the explosive safety exposure hazard, a removal action is proposed for the Target Areas, Firing Points and OB/OD Areas. Although the remaining areas generally pose a negligible explosive safety hazard, additional removal actions are proposed within these areas based on future land use.

8.1.2 A preferred alternative was selected as the most practicable permanent solution for each of the site types to reduce the explosive hazard exposure Cleanup action alternatives were initially screened against minimum threshold requirements, as described in Section 6. The cleanup action alternatives were subsequently evaluated against the selection criteria using the disproportionate cost analysis methods specified in MTCA. This section presents the recommended cleanup action(s) for Camp Bonneville.

8.2 RECOMMENDATIONS BY MEC SOURCE SITE TYPE

8.2.1 Target Areas

8.2.1.1 The Target Area MEC Source sites at Camp Bonneville consist of eight (8) target areas. Three of these target areas (West Impact Area Car Target 2, Combined Impact Area 1, and Combined Impact Area 2) are located within the Central Impact Area and recommendations for these three targets are described separately in Section 8.2.2. The remaining five target areas include 3.5-inch Rocket Range Target, Rifle Grenade Range Target, Hand Grenade (HE) Range Target, M203 HE Grenade Range Target, and 2.36-inch Rocket Target. UXO items were previously identified at the M203 HE Grenade Range Target during the 1998 site characterization; however, this area was subsequently cleared of MEC in 1999 to a depth of 2 feet. No ordnance items were found below a depth of 14 inches at the M203 HE Grenade Range. Additional MEC clearance actions at this site would not provide additional public safety; therefore, additional clearance will not be conducted at the M203 HE Grenade Range Target.

8.2.1.2 The four remaining Target Areas (3.5-inch Rocket Range Target, Rifle Grenade Range Target, Hand Grenade (HE) Range Target, and 2.36-inch Rocket Target),

have the highest relative explosive safety risk, based on the type and likelihood of MEC occurrence. The results of the qualitative explosive hazards exposure assessment also indicated a relatively high level of exposure risk in these Target Areas ("A" ranking).

8.2.1.3 The frost depth (14-inch) clearance cleanup action alternative with ICs (Alternative 4) was determined to be the most practicable permanent solution for the four Target Areas based on the disproportionate cost analysis (Section 7.3). A frost depth clearance (Alternative 4) at the 3.5-inch Rocket Range Target, Rifle Grenade Range Target, Hand Grenade (HE) Range Target, and 2.36-inch Rocket Target would substantially eliminate the explosive hazard at these sites since the future activities anticipated to occur in these Target Areas are surficial and non-intrusive. The implementation of the site-specific ICs (included as part of Alternative 4) would provide for the necessary public awareness of the former military use of the site. Due to the prior removal action conducted at the M203 Range Target additional subsurface removal actions are not warranted. Site-specific ICs (Alternative 2), however, are recommended for the M203 Range Target. Table 8.1 summarizes the recommended cleanup actions for the Target Areas.

TABLE 8.1
SUMMARY OF RECOMMENDED CLEANUP ACTIONS – TARGET AREAS

Target Sites	Explosive Risk Rank	Depth of Activity/Reuse	Recommended Alternative
3.5-inch Rocket Range Target	Highest	Surface/Firing Range	Alt. 4 – Frost Depth (14-inch) clearance with ICs
Rifle Grenade Target	Highest	Surface/Firing Range	Alt. 4 – Frost Depth (14-inch) clearance with ICs
Hand Grenade (HE) Target	Highest	Surface/Firing Range	Alt. 4 – Frost Depth (14-inch) clearance with ICs
2.36-inch Rocket Target	Highest	None/Regional Park	Alt. 4 – Frost Depth (14-inch) clearance with ICs
M203 HE Grenade Target	Negligible[\1]	None/Regional Park	Alt. 2 - ICs

8.2.1.4 The clearance action will be conducted in the footprint of each the Target Areas as shown in Figure 8.1. The area and extent of the targets is based upon prior characterization and reconnaissance efforts. Removal actions will be initiated at the presumed target center and will proceed outward in a grid-based manner. The actual clearance area will be adjusted based upon items recovered during fieldwork. The size of the targets may increase or decrease depending upon the amount of UXO recovered. The calculated total area for the removal action is approximately 10.6 acres and the total area for ICs is approximately 14.6 acres. The depth of MEC clearance for each of the Target Areas is 14-inches based on the future surficial and non-intrusive reuse activities. A clearance to 14-inches will achieve the cleanup standard of negligible interaction with the MEC source at Target Areas. Site-specific ICs will include installation of signage at each of the Target Areas to increase the publics' awareness of the past military activities conducted at the site. The cost to implement the recommended cleanup action in the

Figure 8.1 Target Cleanup Action Areas

Target Areas is estimated at $279,000 and is summarized in Table 8.2 and Appendix C. The cost for site-specific ICs includes both the installation and maintenance costs of signage for 10 years.

TABLE 8.2
COST ESTIMATE FOR TARGET AREAS[1]

Item	Cost per Acre	Acreage	Total Costs
Alternative 4			
MEC Removal	$13,153	10.6	$139,000
A-E Field Oversight	$1578	10.6	$17,000
A-E Project Management	$1,052	10.6	$11,000
Land Survey	$500	10.6	$5,300
Brush Cut	N/A	10.6	$26,400
Institutional Controls	$1,500	10.6	$16,950
Costs Contracting & Oversight	N/A	N/A	$32,000
		Alternative 4 Subtotal	**$248,000**
10% Contingency			$24,800
		Total Cost Estimate Alternative 4	**$273,000**
Alternative 2 (M203 HE Grenade Range Target Only)			
Institutional Controls	$1,500	4.0	**$6,000**
		Total Cost Estimate*	**$279,000**

*Note: The total cost estimate is rounded to the nearest 1000 for the FS. Detailed cost estimates are presented in Appendix C.

8.2.2 Central Impact Target Area

8.2.2.1 The Central Impact Target Area OE Source site, located in the central portion of Camp Bonneville, is comprised of three adjacent target areas, known as the West Impact Area Car Target 2, Combined Impact Area 1, and Combined Impact Area 2. Four UXO items were recovered during the site characterization in 1998 and included one 2.36-inch HE rocket and three 105mm HE-filled artillery rounds. During the site reconnaissance in 2001, one additional 105mm artillery round was identified.

8.2.2.2 The Central Impact Target Area has a high relative explosive safety risk ranking based on the type and likelihood of MEC occurrence. There are no planned future reuse activities for the Central Impact Target Area. This area is located within the fenced portion of the Central Impact Area. Due to the steep, rugged terrain and existing fencing, the number of potential receptors is very small and access to this area is very

limited. The results of the qualitative explosive hazards exposure assessment indicated a moderate – high level of exposure risk in the Central Impact Target Area.

8.2.2.3 Alternative 2 (ICs) was determined to be the most practicable permanent solution for the Central Impact Target Area. Implementation of site-specific ICs (signage) will inform the public about this area's past usage and land use controls in the form of restrictive covenants will prohibit any future development and/or forestry activities at this site.

8.2.2.4 The ICs will be implemented for the footprint of the Central Impact Target Area as shown in Figure 8.2. The total area is approximately 83 acres. Site-specific ICs include installation of signs and implementation and enforcement of land use controls at the Central Impact Target Area. The cost to implement the recommended ICs alternative action in the Central Impact Target Area is $124,500. The cost for site-specific ICs includes both installation and maintenance costs of signage and fencing, and land use controls for 10 years.

8.2.3 Open Burn/Open Detonation Areas

8.2.3.1 The OB/OD MEC Source sites consist of three OB/OD sites at Camp Bonneville, known as Demolition Area 1, Demolition Area 2 and Demolition Area 3. A wide range of explosives and ordnance were reportedly disposed of at the OB/OD areas. During the site characterization, a 4.5-inch rocket was recovered near Demolition Area 3 and a 2.36-inch HEAT rocket and an HE-filled 2.75-inch rocket were recovered in the vicinity of Demolition Area 1. As a result of these findings, a 10-acre surface clearance was performed at Demolition Area 1. Eight UXO items were recovered during the surface clearance and included two HE-filled 2.75-inch rockets and six 35mm M73 practice rockets. In addition, the entire Demolition 1 area (2.5 acres) has been removed as part of a removal action conducted in 2004. Therefore, additional subsurface clearance is not warranted in the immediate Demolition 1 Area.

8.2.3.2 The OB/OD Areas have a high relative explosive safety risk ranking based on the type and likelihood of MEC occurrence. The three OB/OD sites are readily accessible by roads and trails. Demolition Area 1 is a low future reuse area as it is located in the proposed WMA. Demolition Area 2 is a high future reuse area since Clark County is proposing a "Logging Camp" at this location. Intrusive activities may be conducted in the logging camp. Demolition Area 3 is a medium future reuse area as it is near to the planned Environmental Study Area (ESA). The results of the qualitative explosive hazards exposure assessment indicated a medium to high level of exposure risk at the OB/OD sites.

8.2.3.3 The subsurface clearance cleanup action alternative (Alternative 5) was determined to be the most practicable permanent solution for OB/OD Demolition 2 and Demolition 3 Areas based on the disproportionate cost analysis. A subsurface clearance cleanup action alternative at these two OB/OD Source areas would eliminate substantially all of the explosive exposure risk. In addition, surface clearance

Figure 8.2 Central Impact Target Cleanup Action Areas

(Alternative 3) in a "buffer area" surrounding all three OB/OD sites will remove potential MEC that may have resulted from kick-outs. Kick-outs from demolition activities are expected to be located on the ground surface (not subsurface). The implementation of ICs (as part of Alternatives 2 and 5) would also provide the necessary public awareness of the former ordnance usage at these sites to park visitors. Therefore, the recommended cleanup action alternative is a subsurface clearance at the two OB/OD sites, with additional surface clearance in a buffer area adjacent to each site, and implementation of site-specific ICs. Performing this recommended cleanup action alternative will achieve the cleanup standard of negligible interaction with the OE source. The recommended alternatives are summarized in Table 8.3

TABLE 8.3
SUMMARY OF RECOMMENDED CLEANUP ACTIONS – OB/OD AREAS

OB/OD Sites	Acres	Explosive Risk Rank	Depth of Activity/Reuse	Recommended Alternative
Demo Area 1	2.5	None(1)	None/ Wildlife Mgt Area	Alt. 3 – Surface sweep with ICs (buffer)
Demo Area 2	2.0	Highest	Subsurface/Logging Area	Alt. 5 – Subsurface clearance, plus Alt. 2 – Surface sweep with ICs (buffer).
Demo Area 3	2.0	Highest	None/Regional Park	Alt. 5 – Subsurface clearance, plus Alt. 2 – Surface sweep with ICs (buffer).

(1) Demo Area 1 removed as part of 2004 removal action.

8.2.3.4 The subsurface clearance will be performed at the OB/OD sites as shown in Figure 8.3. The recommended depth of MEC clearance is 4-feet and will be performed in a 300-foot x 300-foot grid centered over the Demolition Areas 2 and 3. The area and extent of the OB/OD Areas is based upon prior characterization and reconnaissance efforts. Removal actions will be initiated at the presumed center and will proceed outward in a grid-based manner. The actual clearance area will be adjusted based upon items recovered during fieldwork. The size of the subsurface clearance area may increase or decrease depending upon the amount of UXO recovered. A surface clearance will also be performed extending 500 feet in all directions beyond the 300-foot x 300-foot grid over the Demolition Areas 2 and 3 as shown in Figure 8.3. No subsurface clearance cleanup action will be required at the Demolition Area 1 site since it is co-located with Landfill 4, and the entire 2.5-acre footprint has been removed as part of a removal action. However, a surface clearance will be performed at the Demolition Area 1 site in the footprint area (shown in Figure 8.3) similar to the Demolition Areas 2 and 3. The total area for the 4-foot clearance at Demolition Areas 2 and 3 is approximately four (4) acres (2 acres each). The total area for the surface clearance at Demolition Areas 1, 2, and 3 is approximately 110 acres (approximately 36 acres each). Site-specific ICs include installation of signs at the OB/OD sites to inform the public of the past military usage of the site. The cost to implement the recommended cleanup action at the OB/OD sites is $1,270,000 and is summarized in Table 8.4 and Appendix C. The cost for site-specific ICs includes both installation and maintenance costs of signage for ten (10) years.

Figure 8.3 Open Burn/Open Demolition Cleanup Action Areas

TABLE 8.4
COST ESTIMATE FOR OB/OD AREAS[1]

Item	Cost per Acre	Acreage	Total Costs
Alternative 5 (48" Clearance for Demo 2 & 3 only)			
MEC Removal	$21,600	4	$86,400
A-E Field Oversight	$2,592	4	$10,000
A-E Project Management	$1,728	4	$6,910
Land Survey	Lump-Sum	4	$2,000
Brush Cut	N/A	4	$10,000
Institutional Controls	$1,500	4	$3,000
Costs Contracting & Oversight	N/A	N/A	$17,800
		Subtotal	**$136,000**
10% Contingency			$13,648
		Total Alternative 5 Cost Estimate*	**$150,000**
Alternative 3 (Buffer areas for Demo 1, 2, & 3)			
MEC Removal	**$6,290**	110	$692,000
A-E Field Oversight	**$755**	110	$83,057
A-E Project Management	**$500**	110	$55,000
Land Survey		110	$55,000
Costs Contracting & Oversight	**$1,207**	110	$132,800
			$1,020,000
10% Contingency			$101,800
		Total Alternative 3 Cost Estimate*	**$1,120,000**
		Total Cost Estimate*	**$1,270,000**

* Note: The total cost estimate is rounded to the nearest 1000 for the FS. Detailed cost estimates are presented in Appendix C.

8.2.4 Firing Points

8.2.4.1 The Firing Points MEC Source sites at Camp Bonneville consists of six mortar firing positions, seven artillery firing positions, one rifle grenade range firing point, one 3.5-inch rocket range firing point, and one M203 40mm HE Grenade Range. No UXO or MEC items were discovered at any Firing Points locations during the site characterization efforts. Only non-deployed military munitions are anticipated to be present at Firing Points since the ordnance release mechanism at these locations is a result of abandonment, burial, or mishandling of non-deployed munitions in shallow pits. As discussed previously, the M203 40mm HE Grenade Range was cleared to a depth of 2 feet. Further clearance actions at this site would not provide additional public safety.

8.2.4.2 The Firing Points MEC Source sites have a medium relative explosive safety risk ranking based on the type and likelihood of MEC occurrence. The Firing Points are accessible based on their proximity to roads and trails. The activities proposed for future

reuse areas which overlie the Firing Point locations are surficial and non-intrusive. The results of the qualitative explosive hazards exposure assessment indicated a medium to high level of exposure risk at the Firing Points locations.

8.2.4.3 The frost depth (14-inch) clearance cleanup action alternative was determined to be the most practicable permanent solution for the Firing Point OE Source sites based on the disproportionate cost analysis. A frost depth clearance cleanup action alternative at the Firing Point MEC Source areas would substantially eliminate the explosive exposure risk. The implementation of site-specific ICs would also provide the necessary public awareness of the former military use of the site to park visitors. Therefore, the frost depth clearance with site-specific ICs (Alternative 4) is recommended as the MEC cleanup action for the Firing Points.

8.2.4.4 The clearance action will be conducted in the footprint of each the Firing Points as shown in Figure 8.4. The total area for the removal action is approximately nineteen (19) acres. This is based on an approximate 2-acre clearance around each artillery firing position, a 0.5-acre clearance around each mortar firing position, and a 1-acre clearance around the 3.5-inch Rocket and Rifle Grenade firing points. The depth of MEC clearance for each of the Firing Points is frost depth (14-inches) based on the future surficial and non-intrusive reuse activities. A frost depth clearance to a depth of 14-inches will achieve the cleanup standard of negligible interaction with the MEC source at Firing Point locations. Site-specific ICs will include installation of signage at each of the Firing Points to increase the publics' awareness of the past military activities conducted at these sites. The cost to implement the recommended cleanup action at the Firing Point locations is $421,000and is summarized in Table 8.5 and Appendix C. The cost for site-specific ICs includes both the installation and maintenance costs of signage for 10 years.

TABLE 8.5
COST ESTIMATE FOR FIRING POINTS

Item	Cost per Acre	Acreage	Total Costs
MEC Removal	$11,294	19	$214,600
A-E Field Oversight	$1,355	19	$25,752
A-E Project Management	$903	19	$17,168
Land Survey	Lump-Sum	19	$9,500
Brush Cut	N/A	19	$32,500
Institutional Controls	N/A	19	$33,000
Costs Contracting & Oversight	N/A	N/A	$49,878
		Subtotal	**$382,000**
10% Contingency			$38,200
		Total Cost Estimate*	**$421,000**

* Note: The total cost estimate is rounded to the nearest 1000 for the FS. Detailed cost estimates are presented in Appendix C.

Figure 8.4 Firing Point Cleanup Action Areas

8.2.5 Training Areas

8.2.5.1 The OE risk assessment concluded that only one (1) Training Area (the M203 Practice Range co-located with the Mortar Practice Range) poses an explosive safety risk. The explosive safety risk at this site was described as low. As a result of the site characterization findings, an interim removal action to a depth of 2 feet depth was completed in 1998 on both of the M203 Grenade Ranges. Three (3) UXO items were recovered during the interim removal action at the M203 Practice Grenade Range. The likelihood that any UXO remains at this site is negligible. The overall explosive hazards exposure is considered to be low as the result of the site characterization and interim removal action findings for this site.

8.2.5.2 The ICs alternative (Alternative 2) is determined to be the most practicable permanent solution for the co-located M203 Practice Range and Mortar Practice Range based on the disproportionate cost analysis. The implementation of site-specific signage would provide the necessary public awareness of the former military usage of this site to park visitors and will achieve the cleanup standard of negligible interaction with the MEC source at this site. The cost to implement the site-specific ICs at this site is estimated at $6,000. The cost for site-specific ICs includes both the installation and maintenance costs of signage for 10 years.

8.2.6 Range Safety Fans

8.2.6.1 The Range Safety Fan OE Source sites consist of a total of sixteen (16) range safety fans associated with each of the sixteen Firing Point locations. The majority of Camp Bonneville site is overlain by one or more Range Safety Fans. The Range Safety Fans are designed to contain those single event items that fall at some distance from their intended target. The likelihood of encountering ordnance in a Range Safety Fan is negligible, because of the infrequent historical artillery firing practices and the large size of the Range Safety Fans.

8.2.6.2 The Range Safety Fans have a low relative explosive safety risk ranking based on the type and likelihood of MEC occurrence. The proposed future reuse of these areas is considered low, except for those Range Safety Fans that overlie a High Reuse Intensity Area. The recommended cleanup actions for the High Intensity Reuse Areas are described in 8.3.11. The results of the qualitative explosive hazards exposure assessment indicated a low level of exposure risk at the Range Safety Fans.

8.2.6.3 The ICs alternative is determined to be the most practicable permanent solution for the Range Safety Fan MEC Source sites. The ICs at the Range Safety Fans will include implementation of site-wide ICs as described in Section 8.4. These site-wide ICs will inform the public of the past military history of Camp Bonneville and they will modify people's behavior should they encounter an MEC item. Implementation of site-wide ICs will achieve the cleanup standard of negligible interaction with the MEC source at these sites.

8.2.7 Storage Magazines/Transfer Points

8.2.7.1 The solitary Storage Magazine / Transfer Point MEC Source site at Camp Bonneville is Building 2950. Building 2950 area is an ammunition storage area consisting of three bunkers located approximately 1000 feet northeast of the Camp Bonneville cantonment area. The likelihood of any non-deployed military munitions at this site is remote. This site has a very low relative explosive safety risk ranking based on the type and likelihood of MEC occurrence. This site is located within the proposed regional park and is fenced and there are no proposed reuse activities at this location. The overall explosive hazards exposure is very low.

8.2.7.2 The ICs alternative was determined to be the most practicable permanent solution for the Building 2950 areas based on the disproportionate cost analysis. The site-specific ICs include installation of signs at this site. Signs will inform the public of the past military history of the Building 2950 and they will modify people's behavior should they encounter an MEC item. Implementation of site-specific ICs will achieve the cleanup standard of negligible interaction with the MEC source at this site. The cost to implement the site-specific ICs is estimated $ 3,000. The cost for site-specific ICs includes both the installation and maintenance costs of signage for ten (10) years.

8.2.8 Maneuver Areas

8.2.8.1 The Maneuver Areas MEC Source sites are those areas that were not specifically identified as troop training areas. Maneuver Areas overlay the vast majority of the Camp Bonneville site. Maneuver Areas included the roads and trails, bivouac, and maneuver areas, including the Killpack and Bonneville cantonment areas. The Maneuver Areas have a very low relative explosive safety risk ranking based on the type and likelihood of MEC occurrence. The results of the qualitative explosive hazards exposure assessment indicated a very low level of exposure risk at the Maneuver Areas.

8.2.8.2 The ICs alternative is determined to be the most practicable permanent solution for the Maneuver Areas MEC Source sites. The ICs proposed for the Maneuver Areas will include implementation of site-wide ICs as described in Section 8.4. These site-wide ICs will inform the public of the past military history of the Camp Bonneville and they will modify people's behavior should they encounter an MEC item. Implementation of site-wide ICs will achieve the cleanup standard of negligible interaction with the MEC source at these sites.

8.2.9 Central Impact Area

8.2.9.1 The Central Impact Area is approximately 458 acres in size. It is comprised of the 83 acre Central Impact Target Area and 375 acres of associated Range Safety Fans. The Central Impact Area is currently fenced off, with a three-strand barbed wire fence encircling the entire area. Additionally, signage warning of the potential danger to trespassers is currently in place. People are not expected to venture into this site due to the fencing, signage, and steep terrain; therefore the number of potential human receptors

is considered negligible. The Central Impact Area (not including the target areas) has a medium relative explosive safety risk ranking based on the type and likelihood of MEC occurrence. The results of the qualitative explosive hazards exposure assessment indicated a medium level of exposure risk at the Central Impact Area.

8.2.9.2 The ICs alternative (Alternative 2) was determined to be the most practicable permanent solution for the Central Impact Area MEC Source (excluding the target areas) site based on the disproportionate cost analysis. Site-specific ICs include installation of additional signs, maintenance of the existing fence, and implementation and enforcement of land use controls at the Central Impact Area. The signage will inform the public about this area's past usage and the fence will restrict the entry to this area. The restrictive covenants will prohibit any future development and/or forestry activities in the Central Impact Area. Implementation of these site-specific ICs will achieve the cleanup standard of negligible interaction with the MEC source at this site. The estimated cost to implement the site-specific ICs is $573,000. The cost for implementation of site-specific ICs includes both the installation and maintenance costs for 10 years.

8.2.10 Roads and Trails

8.2.10.1 There are approximately 46 miles of Roads and Trails throughout Camp Bonneville, of which 25 miles are located within the proposed Regional Park (Figure 2.2). The Roads and Trails have the same munitions related historical use and characteristics as the Maneuver Areas. The 2002 reconnaissance field efforts resulted in complete coverage of the existing Roads and Trails located within Camp Bonneville. The only items recovered within a 50-foot buffer along the Road and Trails during the reconnaissance efforts were expended pyrotechnics and small arms ammunition.

8.2.10.2 The Roads and Trails have a very low relative explosive safety risk ranking based on the type and likelihood of MEC occurrence. A relatively large number of potential receptors are expected along the Roads and Trails located in the proposed regional park, with fewer receptors expected on the Roads and Trails. The results of the qualitative explosive hazards exposure assessment indicated a very low level of exposure risk along the Roads and Trails.

8.2.10.3 The frost depth clearance with ICs alternative (Alternative 4) was determined to be the most practicable permanent solution for the Roads and Trails based on the disproportionate cost analysis. The frost depth clearance will include geophysical mapping of the roads and trails and excavation (up to a depth of 14-inches) of identified anomalies. The established roads and trails are reportedly 20-feet wide. Site-specific ICs will include installation of signs along the roads and trails at appropriate intervals to inform the public about the past military use of the site. Implementation of Alternative 4 will achieve the cleanup standard of negligible interaction with any OE items. The cost to implement Alternative 4 on the Roads and Trails is estimated at $2,142,000 and is summarized in Table 8.6 and Appendix C. The cost for site-specific ICs includes both the installation and maintenance costs of signage for ten (10) years.

TABLE 8.6
COST ESTIMATE FOR ROADS AND TRAILS

Item	Cost per Acre	Acreage	Total Costs
OE Removal	$11,160	110	$1,227,600
A-E Field Oversight	$1,339	110	$147,312
A-E Project Management	$892	110	$98,208
Land Survey	Lump-Sum	110	$55,000
Brush Cut	N/A	110	$0
Institutional Controls	$1,500	110	$165,000
Costs Contracting & Oversight	N/A	N/A	$253,968
		Subtotal	**$1,947,090**
10% Contingency			$194,709
		Total Cost Estimate*	**$2,142,000**

* Note: The total cost estimate is rounded to the nearest 1000 for the FS. Detailed cost estimates are presented in Appendix C.

8.2.11 High Intensity Reuse Areas

8.2.11.1 The High Intensity Reuse Areas are the designated reuse areas identified on the Clark County Preliminary Site Plan (January 2003). These sites comprise approximately 210 acres within the proposed regional park. The future visitors to Camp Bonneville will conduct a wide range of recreational and educational activities within the footprint of these High Intensity Reuse Areas. The High Intensity Reuse Areas have a low relative explosive safety risk ranking based on the type and likelihood of MEC occurrence. The results of the qualitative explosive hazards exposure assessment indicated a low level of exposure risk in the High Intensity Reuse Areas.

8.2.11.2 For proposed intrusive activities within the High Intensity Reuse Areas the subsurface clearance with ICs alternative (Alternative 5) was determined to be the most practicable permanent solution, based on the disproportionate cost analysis. The recommendation is for a subsurface clearance cleanup action conducted at the proposed intrusive high intensity reuse sites due to the relatively large number of potential receptors at these areas. A subsurface clearance cleanup action alternative at these intrusive areas would eliminate substantially all of the explosive exposure and provide an additional measure of public safety. It is recommended that clearance to a depth of 4 feet be performed in the planned Logging Camp and within the footprints of any planned construction sites.

A frost depth clearance (14-inches) is the recommendation for those areas where the planned high intensity reuse areas have activities that are surficial and non-intrusive (RV camping, parking, archery and firing ranges, etc.). The clearance action will be conducted in the footprint of each the High Intensity Reuse Areas as shown in Figure 8.5. The site-specific ICs will include signage to inform the public about the past military use of each area. Implementation of the recommended clearance actions and site-specific ICs will achieve the cleanup standard of negligible interaction with any MEC items.

Figure 8.5 High Intensity Reuse Cleanup Action Areas

8.2.11.4 The total area estimated for conducting the frost depth clearance is approximately 160 acres as shown in Figure 8.5. The area estimated for requiring the 4-foot clearance is approximately 50 acres and includes the Rustic Retreat Future Expansion, Logging Camp, Tent and Yurt Camping sites and an estimated additional 5 acres for other construction sites. The cost to implement the recommended cleanup action in the High Intensity Reuse Areas is estimated at $7,069,000 and is summarized in Table 8.7 and Appendix C. The cost for site-specific ICs includes both the installation and maintenance costs of signage for 10 years.

TABLE 8.7
COST ESTIMATE FOR HIGH INTENSITY REUSE AREAS

Item	Cost per Acre	Acreage	Total Costs
Alternative 5 (48" clearance proposed intrusive areas only)			
MEC Removal	$24,000	50	$1,200,000
A-E Field Oversight	$2,880	50	$144,000
A-E Project Management	$1,920	50	$96,000
Land Survey	Lump-Sum	50	$25,000
Brush Cut	N/A	50	$250,000
Institutional Controls	$1,500	50	$75,000
Costs Contracting & Oversight	N/A	N/A	$268,500
		Subtotal	**$2,058,500**
10% Contingency			$205,850
		Alternative 5 Cost Estimate*	**$2,264,000**
Alternative 4 (14" clearance for non-intrusive areas)			
MEC Removal	$13,950	160	$2,232,000
A-E Field Oversight	$1,674	160	$267,840
A-E Project Management	$1,116	160	$178,560
Land Survey	Lump-Sum	160	$80,000
Brush Cut	N/A	160	$800,000
Institutional Controls	$1,500	160	$240,000
Costs Contracting & Oversight	N/A	N/A	$569,760
		Subtotal	**$4,368,160**
10% Contingency			**$436,816**
		Alternative 4 Cost Estimate*	**$4,805,000**
		Total	**$7,069,000**

*Note: The total cost estimate is rounded to the nearest 1000 for the FS. Detailed cost estimates are presented in Appendix C.

8.2.12 High-Accessible Medium Intensity Reuse Areas

8.2.12.1 High-Accessible Medium Intensity Reuse Areas comprise those areas in the proposed regional park that are located between the High Intensity Reuse Areas, have a gentle topographic slope and low vegetative cover, and therefore provide the opportunity to draw people together for informal recreational activities. These areas cover approximately 180 acres along the Lacamas Creek valley floor. The High-Accessible Medium Intensity Reuse Areas have a low relative explosive safety risk ranking based on the type and likelihood of MEC occurrence. The results of the qualitative explosive hazards exposure assessment indicated a low level of exposure risk in the High-Accessible Medium Intensity Reuse Areas.

8.2.12.2 The frost depth clearance with ICs alternative (Alternative 4) was determined to be the most practicable permanent solution for the High-Accessible Medium Intensity Reuse Areas based on the disproportionate cost analysis. The recommendation is for a frost depth (14-inch) clearance cleanup action to a at the High-Accessible Medium Intensity Reuse Area due to the relatively large number of potential receptors at these areas. A frost depth clearance cleanup action alternative in the High-Accessible Medium Intensity Reuse Area would substantially eliminate the explosive exposure and provide an additional measure of public safety. The clearance action will be conducted in the footprint of the High-Accessible Medium Intensity Reuse Area as shown in Figure 8.6. The ICs will include signage to inform the public about the past military use of the area. Implementation of these site-specific ICs and the clearance action will achieve the cleanup standard of negligible interaction with any MEC items.

8.2.12.3 The total area estimated for conducting the frost depth clearance is approximately 180 acres as shown in Figure 8.6. The cost to implement the recommended cleanup action in the High-Accessible Medium Intensity Reuse Areas is estimated at $4,643,000 and is summarized in Table 8.8 and Appendix C. The cost for site-specific ICs includes both the installation and maintenance costs of signage for ten (10) years.

TABLE 8.8
COST ESTIMATE FOR HIGH-ACCESSIBLE MEDIUM REUSE AREA

Item	Cost per Acre	Acreage	Total Costs
MEC Removal	$11,160	180	$2,008,800
A-E Field Oversight	$1,339	180	$241,056
A-E Project Management	$892	180	$160,704
Land Survey	Lump-Sum	180	$90,000
Brush Cut	N/A	180	$900,000
Institutional Controls	$1,500	180	$270,000
Costs Contracting & Oversight	N/A	N/A	$550,584
		Subtotal	**$4,221,140**
10% Contingency			$422,114
		Total Cost Estimate*	**$4,643,000**

* Note: The total cost estimate is rounded to the nearest 1000 for the FS. Detailed cost estimates are presented in Appendix C.

Figure 8.6 High – Accessible Medium Intensity Reuse Cleanup Action Area

8.2.13 Remaining Medium Reuse Intensity Areas

8.2.13.1 The Remaining Medium Intensity Reuse Areas consist of those areas within the proposed Regional Park that are located between specific designated reuse areas, and do not have the high accessibility characteristics of gentle slope and low vegetation characteristics. The Remaining Medium Intensity Reuse Areas comprise approximately 770 acres. Very few people are expected to enter the Remaining Medium Intensity Reuse Areas since these areas have moderate-impassable vegetative cover and/or moderate-steep terrain characteristics. The Remaining Medium Reuse Intensity Areas have a low relative explosive safety risk ranking based on the type and likelihood of MEC occurrence. The results of the qualitative explosive hazards exposure assessment indicated a low level of exposure risk in the Remaining Medium Intensity Reuse Areas.

8.2.13.2 The ICs alternative (Alternative 2) was determined to be the most practicable permanent solution for the Remaining Medium Intensity Reuse Areas based on the disproportionate cost analysis. The ICs at the Remaining Medium Intensity Reuse Areas will include implementation of site-wide ICs as described in Section 8.4. These site-wide ICs will inform the public of the past military history of the Camp Bonneville and they will modify people's behavior should they encounter an MEC item. Implementation of site-wide ICs will achieve the cleanup standard of negligible interaction with the MEC source at these sites.

8.2.14 Wildlife Management Area

8.2.14.1 The WMA is comprised of approximately 2,000 acres in the eastern portion of the Camp Bonneville site, and includes the DNR leased lands. The WMA acreage does not include the Central Impact Area nor the roads and trails located in the WMA portion of the Camp Bonneville site . The majority of the WMA was used as Maneuver Area and, as such, has a low relative explosive safety risk ranking based on the type and likelihood of MEC occurrence. The results of the qualitative explosive hazards exposure assessment indicated a low level of exposure risk in the WMA.

8.2.14.2 The ICs alternative was determined to be the most practicable permanent solution for the WMA based on the disproportionate cost analysis. The ICs at the WMA will include implementation of site-wide ICs as described in Section 8.4. These site-wide ICs will inform the public and the forestry workers about the past military history of the Camp Bonneville. The site-wide ICs will also aid in MEC recognition and the proper response and reporting procedures. The site-wide ICs will likely modify the timber worker and public behavior, resulting in a decrease in the potential for receptor interaction with potential MEC items. Implementation of these site-wide ICs will achieve the cleanup standard of negligible interaction with any MEC items at this site.

8.3 SITE-WIDE INSTITUTIONAL CONTROLS

8.3.1 Site-wide ICs consisting of land use controls and an education awareness program is recommended. The land use controls will consist of restrictive covenants to

ensure that the regional park remains a park, and the wildlife management area is only used for wildlife management and forestry/timber harvesting. These restrictive covenants will safeguard the public from conducting other actions or activities that may result in an increased level of explosive risk. The educational awareness program will consist of two components: a permit notification program and a printed media program. Permit notification will be conducted for utility connections, infrastructure construction, land surveying, timber logging, and related physical land disturbance tasks. The educational awareness program has several additional components. The printed media program will consist of brochures, newspaper articles, fact sheets, and information packages. An exhibit and display depicting the Camp Bonneville site history should be established as part of the proposed Clark College/Outdoor School in the RP. The cost to implement the recommended site-wide ICs is estimated at $250,000 and is summarized in Table 8.9 . The cost for the site-wide ICs includes both the initial capital costs and the ongoing implementation costs for a ten (10) year period

TABLE 8.9
COST ESTIMATE FOR SITE-WIDE INSTITUTIONAL CONTROLS

Item	Cost Basis	Total Costs
Public Education	LS	$100,000
Interpretive Center	LS	$50,000
Restrictive Covenants	LS	$20,000
Training	LS	$50,000
Miscellaneous	N/A	$30,000
	N/A	
	Total Cost Estimate*	**$250,000**

*Note: Costs are based on Parsons experience on similar projects.

8.4 SUMMARY OF RECOMMENDED CLEANUP ACTIONS BY SITE TYPE

8.4.1 Table 8.10 presents a summary of the recommended cleanup actions and their implementation costs for each of the site types at Camp Bonneville. The cost for implementing site-wide ICs is estimated at $250,000. The total estimated cost for implementing the recommended cleanup actions at Camp Bonneville including the site-wide ICs is $16,774,000. The cleanup actions and areas are shown in Figure 8.7.

TABLE 8.10
SUMMARY OF RECOMMENDED CLEANUP ACTIONS AND COSTS

Site Name	Recommended Cleanup Action	Cost
Target Areas	Frost Depth Clearance (14-inches) with Site-Specific ICs	$273,000
Central Impact Target Area	Site-Specific ICs	$124,000
Open Burn/Open Demolition Areas	Subsurface Clearance (4 feet) at Demolition Areas 2 and 3 in a 300-feet x 300-feet Grid; Surface Clearance near the Demolition Areas 1, 2, and 3 in a 500-feet x 500-feet Grid; and Site-Specific ICs	$150,000 $1,120,000
Firing Points	Froat Depth Clearance (14-inches) with Site-Specific ICs	$421,000
Training Areas (M203 Practice Range/ Mortar Practice Range)	Site-Specific ICs	$6,000
Range Safety Fans	Site-Wide ICs	N/A
Storage Magazines/Transfer Points (Building 2950)	Site-Specific ICs	$3,000
Maneuver Areas	Site-Wide ICs	N/A
Central Impact Area	Site-Specific ICs	$573,000
Roads and Trails	Frost Depth Clearance (14-inches) and Site-Specific ICs	$2,142,000
High Intensity Reuse Areas	Subsurface Clearance (4 feet) for Reuse Areas with Future Intrusive Activities; Frost Depth Clearance (14-inches) for the Reuse Areas with No Future Intrusive Activities; and Site-specific ICs	$2,264,000 $4,805,000
High Accessible – Medium Intensity Reuse Areas	Frost Depth Clearance (14-inches) with Site-Specific ICs	$4,643,000
Remaining Medium Reuse Intensity Areas	Site-Wide ICs	N/A
Wildlife Management Area	Site-Wide ICs	N/A
Site-Wide	Site-Wide ICs	$250,000